

REMARKS

Claims 2, 6, 9, 21, 23 and 26-29 are pending in this application.

I. Claim Rejections Under 35 U.S.C. § 103

A. Shaw et al., Takuya et al. and Lessing

The Examiner rejects claims 21 and 2 under 35 U.S.C. § 103(a) as being unpatentable over Shaw et al. (US 5,330,701) in view of Takuya et al. (JP 02-141402) and further modified by Lessing (US 5,496,655). Applicants respectfully traverse the rejection.

The Examiner states, "It would have been obvious to one of ordinary skill in the art at the time of the invention to utilize the method of producing hydrogen of Takuya [et al.] with the compound of Shaw [et al.] in order to increase the reforming reaction rate for methanol and further, as Lessing teaches the Ni₃Al intermetallic material being used as a catalyst for methane reformation, it would have been obvious to one of ordinary skill in the art at the time of the invention to utilize a similar material for a similar purpose" (see the paragraph bridging pages 2 and 3 of the Office Action). Applicants respectfully disagree.

Shaw et al. disclose an intermetallic powder of Ni₃Al (see col. 10, lines 21-22). However, Shaw et al. do not disclose or suggest that the Ni₃Al powder could increase the reaction rate of a catalytic reaction, and do not disclose or suggest the use of Ni₃Al powder for a methanol reforming reaction.

Takuya et al. disclose the use of a Ni-Cu alloy or an Ni-Zn alloy deposited on an Al-containing metal member for a methanol reforming reaction (see Abstract). However, Takuya et al. do not disclose or suggest the use of a Ni-Al alloy for a methanol reforming reaction, and do not disclose or suggest the use of Ni₃Al in a Ni-Al alloy for a methanol reforming reaction.

As discussed in the enclosed Declaration Under 37 C.F.R. § 1.132, Shaw et al. do not disclose or suggest that a Ni₃Al powder could increase the reaction rate of a catalytic reaction and do not disclose or suggest the use of an Ni₃Al powder for a methanol reforming reaction. Consequently, there would have been no reasonable expectation of success to one of ordinary skill in the art that using the Ni₃Al powder disclosed in Shaw et al. with the Al-containing metal member used in the methanol reforming reaction disclosed in Takuya et al. would increase methanol reforming reactivity.

Furthermore, Lessing discloses Ni₃Al having catalytic activity for a steam reforming reaction of a hydrocarbon. The reference does not disclose or suggest catalytic activity for a

methanol reforming reaction. A hydrocarbon (C_nH_m) is a compound consisting of only carbon atoms and hydrogen atoms. Methanol (CH_3OH) is a type of alcohol, and it is not a hydrocarbon because it includes oxygen. A steam reforming reaction of a hydrocarbon and a methanol reforming reaction are both reactions to form hydrogen, but they are quite different from each other.

In general, in the field of catalytic reactions, a compound exhibits catalytic activity to a specific reaction system. However, when the reaction system differs, for example, when the starting materials differ, the same compound would not necessarily exhibit the same catalytic activity in a different reaction system. One of ordinary skill in the art would recognize that the catalytic activity of a reaction system is not predictable.

Therefore, there would have been no reasonable expectation of success that applying a compound exhibiting catalytic activity in a specific reaction system (i.e., a steam reforming reaction) also exhibits catalytic activity in a different reaction system (i.e., methanol reforming reaction). There would have been no reasonable expectation of success that all compounds would exhibit catalytic activity, simply because a specific Ni_3Al compound exhibits catalytic activity in a specific reaction system (i.e., a steam reforming reaction).

Accordingly, there would have been no reasonable expectation that Ni_3Al , which has catalytic activity in a steam reforming reaction of hydrocarbon, also has activity in a methanol reforming reaction.

Therefore, there would have been no reasonable expectation of success of arriving at the claimed invention in view of Shaw et al., Takuya et al. and Lessing.

Thus, claim 21 would not have been obvious over the references.

Claim 2 depends directly claim 21, and thus also would not have been obvious over the references.

Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

B. Shaw et al., Takuya et al., Lessing and Fukui et al.

The Examiner rejects claim 9 under 35 U.S.C. § 103(a) as being unpatentable over Shaw et al. as modified by Takuya et al. and by Lessing, as applied to claim 21 above, and further in view of Fukui et al. (US 5,635,439). Applicants respectfully traverse the rejection.

As discussed above, there would have been no reasonable expectation of success of arriving at the methanol-reforming method of claim 21 in view of Shaw et al., Takuya et al. and

Lessing.

Fukui et al. do not teach or suggest the methanol-reforming method of claim 21.

Therefore, claim 21 would not have been obvious over the references.

Claim 9 depends from claim 21, and thus also would not have been obvious over the references.

Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

C. Shaw et al., Takuya et al., Lessing and Makoto et al.

The Examiner rejects claim 28 under 35 U.S.C. § 103(a) as being unpatentable over Shaw et al. as modified by Takuya et al. and by Lessing, as applied to claim 21 above, and further in view of Makoto et al. (JP 63-20973). Applicants respectfully traverse the rejection.

As discussed above, there would have been no reasonable expectation of success of arriving at the methanol-reforming method of claim 21 in view of Shaw et al., Takuya et al. and Lessing.

Makoto et al. do not teach or suggest the methanol-reforming method of claim 21.

Therefore, claim 21 would not have been obvious over the references.

Claim 28 depends from claim 21, and thus also would not have been obvious over the references.

Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

D. Shaw et al., Lashmore et al., Coll et al. and Takuya et al.

The Examiner rejects claims 23, 6 and 26 under 35 U.S.C. § 103(a) as being unpatentable over Shaw et al. as modified by Lashmore et al. (US 2008/0014431) and by Coll et al. (US 2003/0042226), and further in view of Takuya et al.

The Examiner asserts that it would have been obvious to one of ordinary skill in the art at the time of the invention to utilize the method of producing hydrogen of Takuya et al. with the compound of Shaw et al. as modified by Lashmore et al. in order to increase the reforming reaction rate for methanol (see page 6, 2nd paragraph).

However, as discussed above, Shaw et al. do not disclose or suggest that a Ni₃Al powder could increase the reaction rate of a catalytic reaction and do not disclose or suggest the use of an Ni₃Al powder for a methanol reforming reaction. Consequently, there would have been no reasonable expectation of success to one of ordinary skill in the art that using the Ni₃Al powder

disclosed in Shaw et al. with the Al-containing metal member used in the methanol reforming reaction disclosed in Takuya et al. would increase methanol reforming reactivity.

Lashmore et al. and Coll et al. do not teach or suggest the methanol-reforming method of claim 23.

Therefore, claim 23 would not have been obvious over the references.

Claims 6 and 26 depend directly from claim 23, and thus also would not have been obvious over the references.

Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

E. Shaw et al., Lashmore et al., Coll et al., Takuya et al. and Fukui et al.

The Examiner rejects claim 27 under 35 U.S.C. § 103(a) as being unpatentable over Shaw et al. as modified by Lashmore et al. and by Coll et al. and further in view of Takuya et al., as applied to claim 23 above, and further modified by Fukui et al.

As discussed above, there would have been no reasonable expectation of success of arriving at the methanol-reforming method of claim 23 in view of Shaw et al., Lashmore et al., Coll et al. and Takuya et al.

Fukui et al. do not teach or suggest the methanol-reforming method of claim 23.

Therefore, claim 23 would not have been obvious over the references.

Claim 27 depends from claim 23, and thus also would not have been obvious over the references.

Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

F. Shaw et al., Lashmore et al., Coll et al., Takuya et al. and Mokota et al.

The Examiner rejects claim 29 under 35 U.S.C. § 103(a) as being unpatentable over Shaw et al. as modified by Lashmore et al. and by Coll et al. and further in view of Takuya et al., as applied to claim 23 above, and further modified by Makoto et al.

As discussed above, there would have been no reasonable expectation of success of arriving at the methanol-reforming method of claim 23 in view of Shaw et al., Lashmore et al., Coll et al. and Takuya et al.

Makoto et al. do not teach or suggest the methanol-reforming method of claim 23.

Therefore, claim 23 would not have been obvious over the references.

Claim 29 depends from claim 23, and thus also would not have been obvious over the references.

Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

II. Conclusion

For these reasons, Applicants take the position that the presently claimed invention is clearly patentable over the applied references.

Therefore, in view of the foregoing remarks, it is submitted that the rejections set forth by the Examiner have been overcome, and that the application is in condition for allowance. Such allowance is solicited.

Respectfully submitted,

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September 29, 2010

Attachments: Declaration Under 37 C.F.R. § 1.132
Catalytic properties of Ni₃Al foils for methanol decomposition
Catalytic properties of alkali-leached Ni₃Al for hydrogen production from methanol
Spontaneous catalytic activation of Ni₃Al thin foils in methanol decomposition
Catalytic Properties of Ni₃Al Intermetallics for Methanol Decomposition